--

Report of the

EIGHTEENTH SOUTHERN PASTURE AND FORAGE CROP IMPROVEMENT CONFERENCE

Plant Industry Station
Beltsville, Maryland

June 14-16, 1961

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Service
Crops Research Division

CR-24-63

Report of the

EIGHTEENTH SOUTHERN PASTURE AND FORAGE CROP IMPROVEMENT CONFERENCE[1]

Agricultural Research Center
U. S. Department of Agriculture
Beltsville, Maryland

PROGRAM

Wednesday - June 14 - Morning

		Page No.
9:00 a.m.	Registration. Plant Industry Station Administration Building.	
10:00 a.m.	Opening Session: M. E. McCullough, Presiding	1
10:10 a.m.	Welcome: Dr. M. G. Weiss, Associate Director Crops Research Division	1
	Dr. T. H. Bartilson, Assistant Director Animal Husbandry Research Division	2
10:30 a.m.	Introduction of Members	2
10:45 a.m.	Pasture, Forage and Related Animal Husbandry Research of the U. S. Department of Agriculture	
	L. A. Moore, Dairy Cattle Research Branch	2
	C. E. Terrill, Sheep Research Branch	3
	H. O. Graumann, Forage and Range Research Branch	4
	E. J. Warwick, Beef Cattle Research Branch	5
11:45 a.m.	Business Session and Announcements	6

Wednesday - June 14 - Afternoon

C. W. Alexander, Tour Master

1:30-5:00 p.m.	Tour I. (GRAP) - Sections 1, 2, 3, and 4	6
	Stops at Growth Regulators and Physiology - Light Weed Control	

---

1 Reported by: D. E. McCloud, Permanent Secretary, USDA, Beltsville, Maryland

Wednesday - June 14 - Evening — Page No.

M. E. McCullough, Presiding

7:00 p.m. Executive Committee Meeting..... 7

Thursday - June 15 - Morning

C. W. Alexander, Tour Master

8:00 a.m. Tour II (MIFT) - Sections 1 and 2..... 7

Stops at Management and Improvement of Forage Crops and Turf Research

Tour III (DABS) - Sections 3 and 4..... 8

Stops at Dairy, Beef, and Sheep Research

Thursday - June 15 - Afternoon

C. W. Alexander, Tour Master

1:00 p.m. Tour II (MIFT) - Sections 3 and 4..... 7

Tour III (DABS) - Sections 1 and 2..... 8

Thursday - June 15 - Evening

M. E. McCullough, Presiding

6:30 p.m. Maryland Fried Chicken Dinner (Roast Beef) - Log Lodge, Agricultural Research Center

Banquet and field trip sponsored by:

Allied Chemical Corporation, Nitrogen Division
American Potash Institute
National Plant Food Institute
Pacific Coast Borax
Southern Nitrogen Company
The Sulfur Institute
United States Borax and Chemical Corporation
W. R. Grace & Company

Speaker: Dr. Frank J. Welch, Assistant Secretary of Agriculture -"Grassland Agriculture in the South" 9

Friday - June 16 - Morning — Page No.

8:30 a.m. Discussions by Interest Groups on: Forage and Pasture Research in the next decade.....

Group I. Plant Breeding and Genetics - A. A. Hanson, Discussion Leader.....

M. G. Weiss..... 13
E. A. Hollowell..... 15
P. R. Henson..... 16
C. H. Hanson..... 17
I. A. Forbes, Jr..... 19

Group II. Plant Pathology - K. W. Kreitlow, Discussion Leader..... 20

Group III. Forage Plant and Animal Grazing Management - D. E. McCloud, Discussion Leader..... 22

11:00 a.m. Closing Business Session - M. E. McCullough, Presiding..... 26

12:00 noon Adjourn

Registration List..... 27

Wednesday Morning, June 14, 1961

M. E. McCullough, Conference Chairman

10:00 a.m. Chairman McCullough called the 18th meeting of the Southern Pasture and Forage Crop Improvement Conference to order, and introduced Dr's Weiss and Bartilson for the official welcome to Beltsville.

Welcome: Dr. M. G. Weiss, Associate Director, Crops Research Division:

We at Beltsville are indeed happy that the Southern Pasture and Forage Crop Improvement Conference chose the Plant Industry Station as their conference location. It is a distinct pleasure to welcome you to our station. We hope your stay will be both pleasurable and profitable.

As some of you have not had occasion to be closely associated with federal agricultural research, an enumeration of the governmental agencies conducting research in the forage field may be of interest. Four Services are involved: the Agricultural Research Service, Forest Service, Agricultural Marketing Service, and the Economic Research Service.

Economic research on forages and pastures, which formerly was conducted in the Farm Economics Research Division of the ARS, is now a part of the newly organized Economic Research Service. Research on off-farm storage of seed, packeting and testing of seeds, is conducted in the Agricultural Marketing Service. Range management research in national forests and adjacent, integrated ranges, is conducted in the Forest Service.

Within the ARS, two groups are of particular interest--the Farm Research Divisions and the Utilization Divisions. In the latter, quality studies on forages, such as the saponin and estrogen studies, are conducted. Research in each of the Farm Research Divisions is of interest to this group. These Divisions are: Agricultural Engineering Research Division, Animal Disease and Parasite Research Division, Animal Husbandry Research Division, Crops Research Division, Entomology Research Division, and Soil & Water Conservation Research Division.

Within the Crops Research Division, research on production, management, genetics and breeding, physiology and pathology of forages is concentrated in the Forage and Range Research Branch. Work in certain other Branches, however, has a direct bearing. Research on weed and nematology control is conducted in the Crops Protection Research Branch. Introduction of forage germ plasm including preliminary evaluation of new species, is a function of the New Crops Research Branch. Also, because of the winter and spring grazing aspects, research on breeding, disease and insect resistance of winter cereals, conducted in the Cereal Crops Research Branch, is of interest.

Please let us know if there is any way in which we can make your visit to Beltsville more informative or interesting.

Welcome: Dr. T. H. Bartilson, Assistant Director, Animal Husbandry Research Division:

I should like to join Dr. Weiss in welcoming you, the Southern Pasture and Forage Crop Improvement Conferees, to Beltsville. We hope that your stay here will be educational and enjoyable.

The Animal Husbandry Division is one of the groups of Farm Research within the Agricultural Research Service. Within the Animal Husbandry Research Division research relating to forages and pastures is conducted in several branches. These include: Beef Cattle Research Branch, Dairy Research Branch, Sheep and Fur Animals Research Branch. In addition, certain phases of work in other units such as the Animal Disease and Parasite Research Division, Entomology Research Division and Agricultural Engineering Research Division is applicable to solution of forage and pasture problems.

During this conference you will meet many of our top research scientists at Beltsville. I am sure that they will do everything possible to make your stay here profitable.

10:30 a.m. Introduction of Members by States.

Chairman McCullough called upon one member from each state to introduce the delegates present.

Final registration tabulations by states are as follows: Alabama 7, Arkansas 1, Florida 7, Georgia 13, Kentucky 6, Louisiana 4, Maryland 20, Mississippi 4, North Carolina 6, Oklahoma 6, Puerto Rico 1, South Carolina 10, Tennessee 3, Texas 6, Virginia 13, District of Columbia 5.

Total registration for the 1961 meetings was 112.

10:45 a.m. Pasture, Forage and Related Animal Husbandry Research of the U. S. Department of Agriculture

L. A. Moore, Dairy Cattle Research Branch

In regard to the research program of the Dairy Cattle Research Branch in relation to forage crops, I feel that this group will be most interested in silage problems. There are five topics about which I should like to venture a few remarks.

1. Silage Covers: The use of silage covers of the plastic type has made it possible to efficiently conserve forage in trench and bunker silos. From data which we have collected at Beltsville, a properly applied plastic cover is worth $.10 to $.12 per square foot in terms of feed saved. A 3 to 4 ml. thick cover costs only $.02 to $.04 per square foot. However, from my observations, plastic covers

are very often poorly applied. In order to obtain the greatest benefit the cover must be weighted down in order to prevent air from circulating beneath the cover. Here at Beltsville we have used 4 to 6" of sawdust for this purpose.

2. Effect of Fertilizer on Silage Quality: Some recent investigations have indicated that the application of nitrogen fertilizers have a marked effect on the quality of the resulting silage. It seems quite probable that silage produced from heavily fertilized crops is more difficult to preserve than silage harvested from crops grown with a low level of fertility. Therefore, it becomes necessary to use more care and make use of additives when making silage from crops heavily fertilized.

3. Intake of Silage: Experimental work at Beltsville has shown that when hay or silage is harvested from the same field that the forage harvested as silage will not be consumed in as large amounts as hay by cattle. The reason for this difference is not clear at the present time. We are only certain that this difference is not due to the water content of the silage since drying silage to the same moisture content as hay does not increase its consumption.

4. Low Moisture Silage: In connection with the acceptability of silage by dairy animals it has been found that low moisture silage (50%) will be consumed in as large amounts as hay dry matter. Therefore, experiments are in progress in an attempt to develop methods for storing low moisture silage.

5. Storing Low Moisture Silage in Tower Silos: Some recent work conducted at Beltsville has shown that low moisture silage (50%) can be stored in tower silos if proper precautions are taken. These precautions consist of chopping the forage at a short theoretical cut (1/4 to 3/8"), having tight doors and applying plastic seal for top of silo. Any precaution that can be taken to press out the air in the silage and keep it out is essential to storing low moisture silage in tower silos. More work is needed before such a practice can be recommended.

C. E. Terrill, Sheep and Fur Animal
Research Branch

Sheep research of the Branch is conducted primarily at Dubois, Idaho; Fort Wingate, New Mexico and Beltsville, Maryland, with some additional work in cooperation with State Stations of California, Colorado, Hawaii, Idaho, Maine, Oklahoma, Texas, Utah and Wisconsin. Breeding work at Dubois includes development and improvement of the new breeds, Columbia and Targhee; developing and crossing of inbred lines, investigation of genetic parameters of economic traits and improvement of selection practices to increase rate of progress. A demonstrational project is underway at Fort Wingate to show the advantage of sire selection for improving Navajo sheep. Comparisons of breeds and their crosses are emphasized at Beltsville. Both wool and meat studies are involved at each location to more adequately measure these products, to determine genetic parameters and to improve the quality of wool and meat produced.

Nutrition studies are concerned with the physiological factors involved in bloat, with evaluation of silage, Bermuda grass hay and other forages, palatability trials and studies of utilization of pelleted feeds. Long time studies of exclusive feeding on pellets involve rate of gain, feed efficiency, death losses, and effects on the digestive tracts. Basic studies on nutrition of range sheep are underway at Dubois. Environmental factors at four geographic locations, namely, Beltsville, Dubois, Las Cruces, New Mexico, and Tifton, Georgia, are being studied with Rambouillet rams over a four-year period. Differences among locations appear to be largely due to differences in feeding and management regimes. Cooperative work at Fort Reno, Oklahoma, have shown that late shorn (late May) ewes produced more lambs than early shorn (early April) ewes. Cooling of rams during the breeding season in hot weather increased fertility. Studies at Beltsville of grazing sheep and cattle, together versus each alone, and of various management practices on pasture in relation to parasitism and rate of gain, are producing encouraging results.

H. O. Graumann, Forage and Range
Research Branch

The Forage and Range Research Branch, one of nine branches in the Crops Research Division, has responsibility for all pasture and forage crops research of the Agricultural Research Service, USDA. Research scientists of the Branch are specialists in the disciplines of agronomy (the two sub-options of breeding and management), plant genetics, plant pathology, plant physiology, and chemistry. The various research programs are set up under seven investigations groups. These are Alfalfa, Clover (includes all the true clovers), Special Purpose Legumes, Grass Breeding and Turf, Humid Pasture and Range Management, Arid Pasture and Range Management, and Seed Production. These programs are designed to cover both basic and applied phases of regional problems. There is coordination between investigations groups which gives a balanced program on pasture and forage crops problems of highest priority.

The entire research program of the Branch includes 44 work locations in 34 States. For the most part, the work locations are on campuses of Land-Grant Universities and Colleges in cooperation with the State agricultural experiment stations. The cooperative arrangement under which we work with the States continues to be of mutual benefit to both the States and the U. S. Department of Agriculture. The research scientists of the Branch assigned research leadership responsibility for investigations groups are consistantly striving to maintain a good balance in their research programs and to coordinate them with research of the various States. The Southern Pasture Conference and similar work conferences held periodically in other regions, plus annual meetings of Regional Forage Crops Technical Committees provide excellent opportunity for periodic review of research programs. This gives sound basis for directing the efforts of our scientists toward the most urgent regional problems facing American farmers. Also it serves as a guide in planning basic research for extending knowledge essential to better understanding of the various phenomena which come into play in the development of improved forage crops varieties and full utilization of these as pasture, range, hay, and silage crops.

E. J. Warwick, Beef Cattle Research Branch

The Beef Cattle Research Branch has a geographically dispersed research program in the breeding, feeding, and management of beef cattle - a high percentage of which is cooperative with State Agricultural Experiment Stations. Since it is estimated that beef cattle the nation over receive 80% of their nutrients from forage, research is centered on attempts to improve efficiency of forage utilization either through breeding beef cattle adapted to perform well on existing feed supplies or to develop nutritional and management regimes which will allow optimum performance. Work to date in much of the South indicates that southern forages often do not produce sufficient energy to enable beef cows to reproduce regularly under pasture conditions. Supplemental feeds have usually improved reproductive rates and fundamental work is underway at Beltsville, Md., and Jeanerette, La., conducted under drylot conditions, to determine specifically the energy and protein needs for successful reproduction. Results to date indicate that energy supply is very important in determining age of puberty in heifers and length of time required for a cow to return to heat after calving. Protein deficiencies apparently reduce appetite and feed intake and thus indirectly result in an energy deficiency. Work is contemplated at Jeanerette, La., in which attempts will be made to determine how nearly pasture will supply needed nutrients for successful reproduction during various seasons of the year.

Research at Beltsville and Fort Reno, Oklahoma, indicate that too high levels of energy are likely to be detrimental to longevity and reproductive efficiency. Thus successful nutrition and management of the brood cow apparently depends upon following a middle ground.

For several years the Beef Cattle Research Branch has been engaged in research on various aspects of the bloat problem. Profound ruminal microbiological changes have been found to occur in feedlot bloaters with increases in slime producing microorganisms being the most apparent. Contrary to the findings in legume bloat, soybean oil in the ration increases feedlot bloat.

Work with pelleted rations at Beltsville, Tifton, Ga., Fort Reno, Oklah., and Front Royal, Va., has shown that pelleting high roughage rations increases feed consumption, gain, and efficiency, while effects of pelleting on high concentrate rations are much less striking - an average feed saving of about 10% without effects on rate of gain being the usual result. Studies on pelleted Coastal bermuda grass hay have shown that pelleting increases rate and efficiency of gain but that pelleted Coastal bermuda grass, alone, has not been a satisfactory fattening ration. Pellets from bermuda grass, varying in quality, have given quite different feedlot results.

Work is being done on the fundamental problems involving factors responsible for the apparent changes in nutritional values of pelleted feed and on uses of chemical evaluations of forages as predictors of digestibility and nutritional values.

11:45 a.m. First Business Session and Announcements.

Chairman McCullough appointed a nominating committee composed of G. B. Killinger, Chairman, P. H. Henson, and J. P. Craigmiles charged with the responsibility of presenting a slate of nominations for incoming chairman to the second business session.

A resolutions committee composed of J. R. Harlan, Chairman, S. H. Dobson, and E. C. Holt was charged with preparation of resolutions for action at the second business session.

An executive committee meeting was announced for 5:00 p.m. in the South Building first floor conference room. Invitations were extended to all conferees for the Maryland Fried Chicken banquet to be sponsored by several commercial concerns.

After instructions on lunch facilities, the first business session adjourned.

Wednesday afternoon, June 14, 1962

This year's conference program was devoted largely to tours of research at the Agricultural Research Center.

Dr. C. W. Alexander, the genial tourmaster, explained the complex, split second, series of sectional tours to be presented: I. GRAP (Growth Regulators and Physiology), II. MIFT (Management and Improvement of Forages and Turf), III. DABS (Dairy Beef and Sheep). The group was divided into four color coded sections each to complete all three tours. Bus transportation was furnished by sponsoring commercial companies.

Tour I. Growth Regulators and Physiology -- Light and Weed Control

GROWTH REGULATORS (STOP A)
Crops Protection Research Branch
Dr. B. C. Smale, Plant Pathologist
Growth Regulator & Antibiotic Invest.

LIGHT PHYSIOLOGY (STOP B)
Plant Physiology Pioneering Research Laboratory
Dr. H. A. Borthwick, Chief Scientist
Dr. R. J. Downes, Plant Physiologist
Dr. H. W. Siegelman, Plant Physiologist

BREAK

LIGHT PHYSIOLOGY (STOP C)
Plant Physiology Pioneering Research Laboratory
Dr. A. A. Piringer, Plant Physiologist

WEED CONTROL (STOP D)
Crops Protection Research Branch
Dr. L. L. Danielson, Leader
Weed Investigations-Horticultural Crops
Mr. W. A. Gentner, Plant Physiologist
Weed Investigations-Horticultural Crops
Dr. J. L. Hilton, Plant Physiologist
Weed Investigations-Agronomic Crops
Dr. L. L. Jansen, Plant Physiologist
Weed Investigations-Agronomic Crops

7:00 p.m. Executive Committee Report

The Southern Pasture and Forage Crops Improvement Conference Executive Committee composed of the conference chairman, past two chairmen, two incoming chairmen, and permanent secretary met and accepted the committee report on a survey of opinions on type and character of future meetings. Results of report to be presented at the general conference business session.

The invitation to hold next year's annual meeting in Texas was accepted. The executive committee also tentatively accepted the Alabama invitation for the 1963 meetings.

Thursday June 15, 1961

Tour II. Management and Improvement of Forages and Turf

FORAGE ECOLOGY (STOP E)
Forage and Range Research Branch
Humid Pasture and Range Investigations
Dr. D. E. McCloud, Investigations Leader
Dr. C. W. Alexander, Research Agronomist

FORAGE PATHOLOGY (STOP F)
Forage and Range Research Branch
Dr. K. W. Kreitlow, Research Pathologist

TURF (STOP G)
Forage and Range Research Branch
Dr. F. V. Juska, Research Agronomist
Grass and Turf Investigations

GRASS IMPROVEMENT (STOP G)
Forage and Range Research Branch
Dr. A. A. Hanson, Investigations Leader
Grass and Turf Investigations

BREAK

TREFOIL & SOUTHERN LEGUMES (STOP H)
Forage and Range Research Branch
Mr. P. R. Henson, Investigations Leader
Trefoil & Southern Legume Investigations

ALFALFA IMPROVEMENT (STOP I)
Forage and Range Research Branch
Dr. C. H. Hanson, Investigations Leader
Alfalfa Investigations

CLOVER IMPROVEMENT (STOP J)
Forage and Range Research Branch
Dr. E. A. Hollowell, Investigations Leader
Clover Investigations

NOSEBAG (STOP X)

Tour III. Dairy, Beef, Sheep

DAIRY METABOLISM LABORATORY (STOP K)
Dairy Cattle Research Branch
Dr. L. A. Moore, Investigations Leader
Dairy Cattle Nutrition Investigations

DAIRY RATE OF STOCKING (STOP L)
Cooperative study between:
Dairy Cattle Nutritive Investigations
Humid Pasture & Range Investigations
Presented by:
Dr. C. H. Gordon
Dairy Cattle Nutrition Investigations
Dairy Cattle Research Branch

BREAK

BEEF CATTLE NUTRITION (STOP M)
Beef Cattle Research Branch
Beef Cattle Nutrition & Management Investigations
Dr. R. E. Davis, Assistant Branch Chief
Dr. J. Gutierrez, Animal Husbandman
Dr. C. J. Elam, Animal Husbandman
Dr. P. A. Putnam, Animal Husbandman

BEEF & SHEEP MIXED GRAZING (STOP N)
Cooperative study between:
Beef Cattle Nutrition & Management Investigations
Sheep Management & Nutrition Investigations
Humid Pasture & Range Investigations
Presented by:

Dr. J. Bond, Animal Husbandman
Beef Cattle Nutrition & Management Investigations
Beef Cattle Research Branch

Dr. C. E. Terrill, Chief
Sheep & Fur Animals Research Branch

Dr. D. E. McCloud, Investigations Leader
Humid Pasture and Range Investigations
Forage and Range Research Branch

SHEEP PARASITES (STOP 0)
Sheep and Fur Animals Research Branch
Mr. I. L. Lindahl, Investigations Leader
Management & Nutrition Investigations

6:30 p.m. Though not heretofore revealed the conference banquet billed as a Maryland Fried Chicken Dinner, and alluded to as resembling the Beltsville turkey, appropriately for a forage conference, was delicious roast beef.

Both the banquet, transportation for the field trips and cokes were provided through the generous sponsorship of the following:

Allied Chemical Corporation, Nitrogen Division
American Potash Institute
National Plant Food Institute
Pacific Coast Borax
Southern Nitrogen Company
The Sulfur Institute
United States Borax & Chemical Corporation
W. R. Grace & Company, Research Division

Speaker for the evening was Dr. Frank J. Welch, Assistant Secretary of Agriculture, and well-known to Southern Pasture and Forage Crop Improvement Conferees as former dean and director of the Kentucky Agricultural Experiment Station. He presented a challenging address, "Grassland Agriculture in the South", as follows:

It is a pleasure to renew my acquaintance with the group. I last met with you in 1957 to welcome you to the University of Kentucky. And now, today, as you meet here for the first time, I have the opportunity to extend a welcome from the United States Department of Agriculture -- and to express our continued interest and support of your efforts.

You can be justly proud of the part you have already played in the improvement of southern pasture and forage crops.

When this group was organized about twenty years ago, the interest in grassland farming in the south was just beginning to grow. The traditional row-crop agriculture was still predominant, and the available pasture was largely worn-out and abandoned cropland. The acreage of worn-out land was increasing alarmingly, and the entire economic structure of southern agriculture was unstable.

There was a serious need for change, and men with vision saw the direction that change should take. The move was started toward livestock farming, built upon more and better grassland. In this way, we could provide better protection for the soil and for the farmer's ability to earn a living. At the same time, the diets of our people could be more easily improved with nutritious livestock products.

This was a new venture for most southern farmers. Their fathers and grandfathers before them had raised row crops, year after year, on the same land. Their farming methods were part of an accepted way of life. But livestock farming was generally strange and unfamiliar. It required new knowledge and new methods of operation.

At that time -- twenty years ago -- there was a surplus of rumor and misinformation and a scarcity of sound knowledge about livestock production, pastures, and forage for the south.

Over the years, as you have worked to exchange information, to pin-point the problems, and then set about to solve them, you have made a great contribution. Southern agriculture is being diversified. As just one example of that fact, beef cattle numbers increased more than 325 percent in ... roughly ... the past twenty years, while the national average increased only 141 percent. That is merely indicative of what is happening in all kinds of livestock farming. We've seen the acres abandoned to brush, briars, and weeds, converted into improved pasture land.

Part of this growth and diversification has been made possible by progress in better livestock breeding and in better overall feeding and managment practices. But the most important contribution toward changing the shape of southern agriculture has been through the results of grassland research, applied to make better pastures.

When this agricultural revolution began in the south, we did not have the grasses and legumes that we needed, specifically adapted to the long, hot and humid growing seasons. Plant varieties had to be sought out from all parts of thw rold ... and then developed for practical use in this country. These new varieties then had to be made available to farmers, along with information about using them in programs of pasture improvement.

You in the various southern states have carried the lion's share in this research and educational effort - working together and with the United States Department of Agriculture. And because we have all had some part in helping to develop this new grassland agriculture, we are close enough to the situation to know that we do not have all the answers. We have come a long way, to be sure -- but we still have a long way yet to go.

In meeting the requirements for further improving southern grassland farming ... for today and in the future ... I believe our two most important objectives are still in education and research.

These objectives are, first: put to work the best knowledge and plant varieties we now have on more acres of southern pastures.

And second: increase our research efforts to find better answers for our problems that are still unsolved.

In meeting the first objective we are faced with the normal time-lag between the development of knowledge in the laboratory and the application of this knowledge on the farm. But as long as we have as many acres of scrubby, unimproved pastures as we have now to support a growing livestock population in the south, then we all have a responsibility to meet. We have a responsibility to help in every way we can to see that southern livestock farmers are using the best available varieties and methods in their pasture and forage management.

In meeting the second objective -- to increase our research efforts -- we have two approaches. Our first responsibility is to solve as quickly as possible the most pressing problems of grassland agriculture in the south. For example, we need even better varieties of grasses and legumes, more specifically adapted to areas of the south. We need to find better ways to protect and build up the soil, with lower fertilizer costs. We need better ways of combating the insect and weed problems peculiar to the hot and humid regions.

These are some of the specific problems that need quick answers that can be found through applied research. In finding these specific answers to agricultural problems, the scientist uses the fundamental knowledge that has already been developed in the various scientific disciplines. He is limited in his search only by the extent of that basic knowledge. Therefore, as we broaden and deepen our fundamental knowledge, than at the same time, we enlarge the search-area for the quick answers.

That is why in this department, we are increasing our emphasis on the second approach to agricultural problems, through basic research. For example, our scientists want to know more about animals, plants, insects, soils and water. They want to know more about their basic structures and about their relationships and inter-action. They are discovering more facts about the effect of light on plants...about basic metabolism in animals...and the reaction of insects to outside stimuli.

As we lear more about such things as these, we should be in a better position to grow the plants, feed the animals, and control the pests that concern us in this agricultural complex.

And all of us here have a part to play...those of us in the United States Department of Agriculture, the land-grant colleges and experiment stations, and in the various industrial groups concerned. Through our cooperative research projects and educational programs, we have the framework for an effective and coordinated effort.

This coordinated system of state and federal cooperation has supported the major progress of agricultural research for nearly 100 years. The U. S. Department of Agriculture and the land-grant college system were born the same year... in 1862. They grew up together into a nationwide system of research and education.

No single national research program would be adequate to serve even the most pressing needs across the broad range of differing agricultural regions in this country. Our program is strengthened by state and regional projects. Many agricultural problems cross state lines and are best suited to the national or regional approach. Certain research studies are -- and should be -- conducted entirely by the states and adapted specifically to their own needs.

But no matter where the major responsibility is assumed -- on a state, regional, or national basis -- continuing cooperation and exchange of ideas should be maintained between the state and federal agencies. Both the States and the U. S. Department of Agriculture should also continue to work with industrial and foundation research groups to extend the scope of agricultural research as far as possible.

We must extend the scope of our research and make the best possible use of our facilities if we are to keep up with the needs of the future. And this is particularly true of the grassland agriculture of the south. I say that because of the expanding population and the growing need for livestock products.

We are all well aware that economists are predicting overwhelming increases in population in this country, assuming the national economy remains stable. By the end of this century -- less than forty years from now --- the population could be nearly twice what it is today. And as we have more people to feed, the increase in requirements for livestock products is expected to be considerably greater than for crops. This might mean more than twice as much meat, milk, and eggs than we are producing now.

These requirements will have to be met with no sizable increase in the amount of agricultural land available. As a matter of fact, urban expansion, more highways and airports, and other expanding needs of a growing population can be expected to take over some of the land now used to produce food. In the west, water limitations, plus growing urban centers, will prohibit extensive grassland expansion in most areas. The agricultural pattern in the middle west is fairly well established. This leaves one area in the United States with a potential for the grassland expansion we need -- the south.

Since we are already well started in this trend -- and as cotton production moves out of the south to areas better suited to mechanization -- we are in a good position to accept this challenge for the future.

And so I say that your interest in improving pasture and forage crops -- in building a better grassland agriculture in the south -- serves more than a regional purpose. It is in the best interest of the entire nation.

Friday Morning, June 16, 1961

Plant Breeding and Genetics Group
A. A. Hanson, Discussion Leader

M. G. Weiss - The objective of varietal registration is to assure association of a certain name or other designation with a specific genotype or group of genotypes. It is a device that is used extensively in European countries and Canada. In the U. S. it is practiced in some of the popular ornamental crops but has not been used extensively in agronomic crops.

Three levels of registration currently are practiced:

1. Registration with no official testing. Registration consists of official assignment of a name to a variety claimed to be new by the originator. A description supplied by the originator is accepted as bona fide evidence of a new variety. This type of registration safeguards only against the assignment of a name that has already been given a variety of the same species. It has been adopted by a number of societies, particularly in the horticultural and ornamentals fields. (The American Rose Society, the American Iris Society, the American Society for Horticultural Science, etc.).

2. Registration after official testing. Registration only after it is determined by official testing that the variety is in fact a new variety. This level of registration is used for certain agricultural crops in most European countries.

3. Registration of meritorious varieties. Registration only if the variety has been found by public tests to be new and superior in some economic character (s) to previously grown varieties. This level of registration is used by the American Society of Agronomy and is similar to the licensing of varieties in Canada. Most European countries also develop approved lists of varieties which correspond to this level of registration.

Both in the U. S. and many European countries, varieties of ornamental and horticultural crops are registered by societies of growers and fanciers and professional societies, and the first level of registration enumerated above is most frequently used. This level of registration fails to prevent the assignment of two or more names to the same variety. Many people feel that this level does more harm than good, in that it gives official recognition to synonyms. Many countries, including the U. S., have adopted laws and regulations prohibiting the sale of seed or propagating materials of a variety under more than one name. Administration of such laws is complicated by registration of more than one name for indistinguishable genotypes.

With respect ot registration of agronomic varieties, regulations and practices used by a number of European countries and Canada were investigated. Adopted practices in the old European countries may provide certain guidelines for the U. S. European countries studied include Austria, Belgium, Denmark,

France, Germany, Italy, Netherlands, Norway, Sweden and the United Kingdom (England and Wales). In five of the European countries studied, most agronomic varieties are developed by private breeders and in two more approximately equal numbers are developed by private and public institutes. Only in Belgium, Norway, and Canada are most varieties developed by Federal and State governments.

In all countries studied, with the exception of Denmark, an official list or registry of varieties is required by law. In all cases varieties established on the list must be determined by official tests to be distinctive from other varieties and to have merit with respect to economic characters. From three to six years of testing is required. To remain on the list, varieties must be retested, varying among countries from annual testing to retresting after a period of four to nine years. In more than half the countries, only varieties on the official list may be offered for sale within that country. In a number of countries royalties are provided to the breeder through a system of "breeders' rights" or trademarking.

In the U. S. no official registry of agronomic crops has been established. The American Society of Agronomy registers varieties of most crops on the meritorious basis. Applications for registration are on a strictly volunteer basis. To date 927 varieties have been registered but this is far from an all inclusive list of varieties grown. A number of manuals and bulletins on variety identification but do not provide an up to date listing of new varieties. The Seed Act Branch, Grain Division, AMS, has prepared variety lists for soybeans, sorghums, cabbage, snap beans and hybrid onions. These lists include variety names, synonyms, and obsolete names.

The international movement of varieties facilitated by improved transportation has stimulated considerable interest in international registration of varieties. The Food and Agriculture Organization of the United Nations has been asked to consider their taking over the international registration of agronomic crop varieties. International registration, of course, is largely dependent on coordination of strong national registration authorities.

A number of questions are posed:

1) Does the stepped-up program on breeding crop varieties by commercial seedsmen increase the need for variety registration in the U. S.?

2) Should registration of agronomic crop varieties be left to government agencies as it is in European countries and Canada?

3) Can professional societies perform a service with respect to registration?

4) At what level should variety registration be practiced?

5) When varieties are registered at either the distinctiveness or merit level, should only official testing be recognized or should adequate data supplied by private breeders be accepted?

The American Society of Agronomy is making a study along the lines of the above questions in an effort to determine their future course of action as to variety registration. The writer, who is serving as chairman of the American Society of Agronomy study committee, would appreciate receiving comments and suggestions from interested personnel.

E. A. Hollowell - There are three phases of clover improvement research which I believe will be of increasing importance in the next decade. These are (1) more life histroy studies to give specific breeding and management objectives; (2) interspecific hybridization; and (3) Rhizobium - host relationships.

Life History Research

By life histpry research, I refer to the interactions of the host to physiological, pathological, entomological and agronomic factors on which more information is needed to effectively make improvements through breeding and management practices. Attention is directed to the fact that the most gains in improvement have been in the area of disease resistance and that while more needs to be done on disease and insect resistance, additional emphasis should be given to physiological factors, i.e., rate of carbohydrate metabolism - biochemical pathways and deposition that occur when the plant is subjected to a range of microclimatic factors, and competitive interactions. Based on accumulating evidence, physiological and agronomic evidence, synthesis and translocation of free sugars, tagged mineral isotopes, and defoliation effects on root and top development, I believe that white clover may be an annual plant that behaves as a perennial through asexual propagation (nodal rooting after the seedling taproot is dead). Morphological - histological evidence is needed to support the physiological - agronomic research. This has been initiated. I believe that interactions between the above mentioned disciplines (team approach concentrating on a specific crop) as related to the productivity, quality and persistency of clovers, as well as for all legumes and grasses are of even more importance than the effect of a single discipline for improved varieties and better management practices of greater magnitude.

Interspecific Hybridization and Gigants

I believe that interspecific hybridization with all of its problems offers more promise in clover improvement than tetraploidy, even though the latter is a useful tool in accomplishing the former. Improvement in sweetclover is a good example of accomplishment (transferring a single gene from one species to another). Viruses are of importance in the production and persistency of white clover. An extensive screening of plants from world-wide collection of white clover ecotypes has not given clones resistant to the bean yellow and alfalfa viruses. Screening of Trifolium species for resistance is in progress. If resistance is found, the transfer of this characteristic to white clover will be attempted through interspecific hybridization.

Since all of the clovers of agricultural importance (a few native species add to the forage resources of the western states) are exotic species, I believe that additional plant explorations, effectively staffed, into those countries that appear to be the origin of most species will be substantially rewarding. Within the last decade, two additional gigants have been introduced - one in Trifolium

resupinatum, and another in Trifolium nigrescens. Insofar as these have been cytologically and genetically examined, they are diploids, the same as earlier introductions. An explanation of the gigant phenomena is not known although it might be related to a Rhizobium - host relationship.

Rhizobium - Host Relationships

I believe that this is a field of research which will be very rewarding in the next decade. Successful clover culture is like a chain; the chain is no stronger than the weakest link. One of these links is Rhizobium - host interactions. Exploratory research in the late thirties indicated definite variability in symbiosis between specificities (single crosses of red clover and single cultures from isolates). Intensive research in Australia has indicated that there are Rhizobium genotypes (two have been studied - efficient symbiosis and early infection effectiveness) and that these are related to host genotypes. Little success in the field can be expected unless there is a team approach. - (a Rhizobium bacteriologist and a plant geneticist) - devoting full-time in joint effort. Possibly the gigants within species can be explained on host - Rhizobium interactions.

P. R. Henson - At present we consider birdsfoot trefoil well adapted to heavy soils above the 40th parallel of latitude. There are a number of good breeding programs under way within this region. We can expect that a number of improved varieties will be released during the next decade. Improvement with respect to yield, persistence under grazing, and in seed production is also expected.

Between the 35th and 40th parallels of latitude, trefoil is not long-lived except in some of the Appalachian Highlands. We expect sufficient improvement in trefoil varieities to make this a productive pasture legume in this central area. There is plenty of evidence to indicate that plant losses are due to crown and root rots. Such plant losses are usually not readily apparent in drilled seedings except under extreme conditions. Second and third year stands may appear quite good but they are generally unproductive. Examination of the roots and crowns usually reveals varying degrees of infection from root rots. Plant losses in spaced nurseries are more striking but usually not as great as in drilled seedings. Actual counts of comparable drilled and spaced plants here showed a 70% plant loss in drilled plots versus a 53% loss in spaced plants.

We have found striking differences in persistence between progenies of persistent clones as compared to progenies from non-persistent (root rot susceptible) types. It is expected that varieties resistant to root rots will soon be under test in this central region.

With regard to sericea lespedeza, we are accumulating still more information on the behavior and the potential value of this species. Since Will Cope from North Carolina is not here, it might be well to review some of the findings with respect to the part tannins are playing in the digestibility and nutritive value of the species. Dr. Cope now has F_3 populations under study coming from crosses between a low tannin plant and vigorous, desirable agronomic types. His studies of the segregating populations have not shown the low tannin plants to be associated with low vigor. His research indicates that low tannin lines will soon be forthcoming from his program. Studies by the chemists and nutritionists at North Carolina have shown the cellulase and pectinase activity in common (high tannin)

sericea to be inhibited. More recent studies have shown no inhibition in activities of these important enzymes in low tannin sericea. This is further evidence that the development of low tannin varieties will result in the production of a more digestible forage.

In recent years crown vetch has exhibited real potentials as a forage plant. Free choice feeding and digestibility trials with sheep by the animal nutritionists here at Beltsville have shown crown vetch to be a good forage. In fact, we have not received any information to indicate that it is not a satisfactory forage either for pasture or hay. There are three named varieties in existence: Penngift from Pennsylvania, Chemung by the Soil Conservation Service in New York, and a recently named variety from Iowa.

Crown vetch appears reasonably well adapted from the Alabama-Tennessee line northward. It shows promise on well drained soils and it is possibly less critical of pH and fertility level than some of our legumes. It is one legume which, if allowed to grow unchecked, will smother out other forage grasses and legumes. We should hear more about crown vetch in the years ahead.

The recent work on compounds in plants other than those reported in feed analyses will undoubtedly be expanded. I am hopeful that the relative importance of these compounds from the nutritional standpoint will be determined during the next decade. All of the legumes which I have covered here contain varying amounts and kinds of tannins. So far as we know none of the species cause bloat in grazing animals. Limited chromatographic studies of the variation of phenols in species within a genus have shown differences in the kinds of phenolic substances present. The nutritional evaluation of these compounds should be possible.

C. H. Hanson - In the decade ahead one is of the opinion that marked advances in the improvement of alfalfa can be expected with respect to: (a) increased resistance to diseases and insects and (b) improved quality. The two, of course, are not independent since resistance affects quality.

I have chosen a few slides illustrating insect and disease problems where resistance results in a sensational improvement in the performance of alfalfa. The slides deal with resistance to the spotted alfalfa aphid, stem nematode, pea aphid, and bacterial wilt. I purposely chose slides which dealt with work in other regions.

Improved disease and insect resistance continues to be a fruitful area of research. Increased resistance to any one of about 20 diseases and insects no doubt would improve performance and quality of alfalfa in eastern United States. Certainly our disease problems exceed those in the Central and Western States; and for that reason, we can expect very significant contributions from resistance.

Notable advances have been made in the isolation and identification of certain biochemical constituents of alfalfa. Progress is also being made in determining their effects on livestock. Different commercial lots of alfalfa hay and meal analyzed by the Western Regional Research Laboratory at Albany, California, differed tremendously in content of saponins, estrogenic-like substances, and

vitamins, but the causes of variation were unknown.

My remaining comments deal with cooperative studies of Alfalfa Investigations with State experiment station workers and the Western Regional Research Laboratory on the causes of variation in coumestrol and saponin contents of alfalfa. The information is taken from a preliminary report.[1]

Coumestrol. The field tests for the production of samples and agronomic data for the coumestrol study are being conducted by the following: H. L. Carnahan and A. W. Hovin, University Park, Pennsylvania; J. W. Dudley, Raleigh, North Carolina; W. R. Kehr, Lincoln, Nebraska; M. W. Pedersen, Logan, Utah; E. L. Sorensen, Manhattan, Kansas; C. P. Wilsie, Ames, Iowa; and E. H. Stanford, Davis, California.

Buffalo, Vernal, Ranger, Lahontan, and Du Puits were the varieties used. The varieties were cut at the one-tenth-bloom stage and analyzed to determine the relative importance of varieties, cuttings, locations, and their interactions on coumestrol content. Additional plots of Ranger and Buffalo were seeded at two locations to determine the effect of stage of growth. Statistical computations included analyses of variance, computations of mean square expectations, estimation of variance components, and covariance analyses. The most important variable or cause of fluctuation in the coumestrol content of alfalfa in the first year of the study was that associated with locations. Locations accounted for more than half of the total variability estimated when alfalfa was cut at the one-tenth-bloom stage. The cuttings x locations interaction accounted for about 20 percent of the total variation and was next in importance. When alfalfa was cut at the one-tenth-bloom stage, the average coumestrol content of all samples for the location with the lowest content was 3 ppm of alfalfa (dry basis), whereas samples for the location with the highest content averaged 147. Samples cut at different stages of growth generally increased in coumestrol content with age. Alfalfa harvested 25 days after full bloom generally had the highest coumestrol content. This study is being continued in 1961.

Saponin. Field tests for the production of samples and agronomic data for the saponin study were conducted by the following:

J. R. Cowan, Corvallis, Oregon; H. L. Carnahan, University Park, Pennsylvania; J. W. Dudley, Raleigh, North Carolina; W. R. Kehr, Lincoln, Nebraska; C. C. Lowe, Ithaca, New York; M. W. Pedersen, Logan, Utah; E. L. Sorensen, Manhattan, Kansas (2 locations); C. P. Wilsie, Ames, Iowa; and E. H. Stanford, Davis, California.

---

[1] Hanson, C. H., and Kohler, G. O. Progress report on a study of cultural factors related to estrogen and saponin content of alfalfa. Proc. 7th Technical Alfalfa Conference, Albany, California. July 27, 1961. In print. (Complete report will be published and authored by those involved in these studies as soon as the work has been completed).

Four varieties, Buffalo, Lahontan, Ranger, and Vernal, were seeded in replicated plots at locations in each of the nine States.

Varieties differed significantly in saponin content, Lahontan being the lowest. Locations, per se, had little effect on saponin content, but the interaction of locations and cuttings was sizable. The largest single source of variation noted in the saponin study was cuttings. The first cutting of the season was considerably lower than the second and the third.

In conclusion, additional information is needed to complete the analysis of the two studies. At the present, however, it is noted that the pattern of variation associated with coumestrol content is different from that characterizing variation in saponin content. Variation in estrogen content appeared to be caused predominantly by environmental factors, half of which was associated with locations. For saponin, on the other hand, location effects were not important. Varieties, cuttings, and interactions between cuttings and locations were the principal causes of variation. This work indicates, therefore, that the methods for changing coumestrol and saponin contents of alfalfa may be quite different. From the standpoint of varietal improvement, one would expect breeding and selection of alfalfa to be more effective in changing saponin than coumestrol content. One must keep in mind, however, that these studies dealt with the overall causes of variation and did not take into account plant-to-plant variation within varieties.

One might expect that the day is coming when livestock men will prefer feeding alfalfa either high or low in coumestrol activity, depending upon the kind of livestock fed. The first year's data from the present study suggest that the area in which the alfalfa grower is producing the crop may be the most important factor affecting coumestrol content.

Ian Forbes, Jr. - Bitter blue lupine (Lupinus angustifolius L.) has been widely grown for over two decades in the lower South (Georgia, Florida, Alabama, and South Carolina) as a winter annual leguminous cover crop. With the introduction and testing of the Swedish sweet variety, Borre, the use of blue lupine as a forage crop for temporary late-winter and early-spring pasture began in 1955. In grazing trials at Tifton, Georgia, this variety yielded over 300 pounds of beef per acre in the late-winter-early-spring grazing period. Furthermore, seeds of Borre blue lupine are produced locally at the rate of 1000 to 2000 pounds per acre. When blue lupine is used as a cover crop, experiment results have indicated that 4 tons of dry matter and 150 pounds of nitrogen per acre can be produced in the above-ground portions of the plants in favorable years. Blue lupine is entirely self-pollinated at Tifton.

One difficulty in the use of Borre as a forage variety in this region was foreseen to be the danger of the contamination of Borre with seeds of bitter blue lupine, which would make the forage unpalatable and poisonous to livestock. Some instances of such contamination have already been observed. This difficulty was overcome through the breeding of Blanco blue lupine and its release in 1959. This variety is equal to Borre in forage production and is genetically marked with the characters white seed coat, white flower, and absence of purple pigmentation from its vegetative parts. Thus, Blanco can be distinguished from commercial bitter blue lupine at any stage in its life cycle.

The next step in improving blue lupine was to incorporate resistance to antracnose and gray leaf spot into a genetically marked forage variety. This has now been accomplished and, if tests for forage production in the next few years are favorable, this variety will be released. Resistance to anthracnose will eliminate the losses of forage and seed that occur throughout the blue lupine region in excessively warm, wet years. Although gray leaf spot causes some defoliation throughout the blue lupine region, resistance to this disease will be most valuable in extreme southern Georgia and northern Florida. In the Gainesville, Florida, area, blue lupine seed production is not practical because gray leaf spot regularly defoliates blue lupine in the spring before seeds can mature.

The next step in improving blue lupine will be to add increased winter-hardiness to the assortment of desirable genes already combined. A source of increased winterhardiness has been located, appropriate crosses have been made, and preliminary screening in the F_2 and F_3 generations of the crosses will begin in the 1961-62 growing season. Selection must be practiced for the following characters; soft seeds (simple recessive); sweetness (simple recessive); white seed coat, white flowers, and absence of purple pigment in vegetative parts (pleiotropic simple recessive); gray leaf spot resistance (simple recessive); anthracnose resistance (simple dominant); and winter-hardiness (inheritance unknown). Screening techniques have been worked out for all these characters except winterhardiness; so winterhardiness will be the last character for which plants will be screened. Meanwhile, methods of screening for increased winter-hardiness will be investigated. A variety with increased winterhardiness would greatly expand the use of blue lupine for forage in the colder parts of the present lupine-growing region.

The search will be continued for sources of resistance to brown spot and to seed shattering. Although brown spot damage can be greatly reduced through the use of clean seed and crop rotation, the disease is capable of completely eliminating stands of blue lupine seedlings where no control measures are taken. Because of some uneveness of seed maturity within plants and the promptness with which the seed pods shatter when they dry, considerable losses of seeds occur, the seeds require drying after combining, and the acreage that can be harvested for seed by a one combine-operator is limited. Thus far, neither irradiation with X-rays and thermal neutrons nor screening of seed accessions has turned up source of resistance to brown spot or seed shattering.

Plant Pathology Group

K. W. Kreitlow - During the past eight years studies have been conducted to determine the effect of virus infection on forage yield, flowering, seed production, and persistence of white clover. Results of greenhouse and field tests earlier showed that virus infection reduced yielding ability by 23-55%. In greenhouse tests flowering ability was reduced 31.7% by virus infection whereas in field plots where replicated plots of two clover clones were compared, flowering was reduced by 20.3 and 43.9%, respectively. Seed yield of the two clones was reduced by virus infection 29.2 and 53.7%, respectively. Tests showed that the viruses involved, namely alfalfa mosaic virus and bean yellow mosaic virus were not seed transmitted.

The effect of virus infection on persistence of white clover was studied by establishing healthy and virus-infected plants of three clonal lines of white clover in field plots. Seventy-seven plants were established in each plot and replicated 3 times beneath a 4 x 8 x 16 foot cage covered with 32 mesh plastic screening. Each group of three plots beneath a cage consisted of either virus-infected or healthy plants. Caging the plants prevented contamination of healthy plants by insect-borne viruses. Thus, known virus-infected plants could be compared with healthy plants during the course of the experiment and all plants were exposed to comparable conditions beneath the cages.

Observations and yields taken during two summers and two winters showed that virus infection greatly reduced winter survival and recovery during the subsequent growing season. In virus-infected plots there were many dead stolons following winter and it required most of the subsequent growing season for plants to recover sufficiently to produce forage. The amount of forage produced was extremely small in comparison to that harvested from virus-free plots. These data support the earlier observations that virus infection in white clover weakens plants so that they are unable to withstand adverse conditions, such as winter injury, summer drought, and high temperature.

Since 1956, studies have been conducted to clarify the nature of a destructive root rot of birdsfoot trefoil. During this period numerous fungi have been isolated from infected roots including species of Fusarium, Leptodiscus, Rhizoctonia, etc. When susceptible rooted cuttings of birdsfoot trefoil were inoculated with these isolates under greenhouse conditions some root discoloration resulted but no severe killing of plants occurred comparable to that observed in the field. High soil and air temperatures, frequent cutting, steamed and untreated field soil all have given no definite clue as to the possible causal agent. In the field, fumigation studies have been conducted with methyl bromide and D-D. Neither of these fumigants had any seeming effect on reducing the root rot incidence suggesting that nematodes are not a causal agent. At present, it is concluded that the destructive root rot of birdsfoot trefoil is due to a complex situation including interactions of pathogenic fungi, high temperature and possibly the lack of moisture along with physiological weakening of the host. Lines of birdsfoot trefoil tolerant to the root rot condition have been isolated and are being increased and tested for further improvement by Mr. Paul R. Henson.

One of our newest studies concerns efforts to improve the artificial inoculation technique and hasten the development of infection by the bacterial wilt organism in alfalfa. To do this, seven-day old wilt-susceptible alfalfa seedlings growing in a layer os sand on steamed soil in pots were artificially infected by inoculating wounded cotyledons with the wilt organism Corynebacterium insidiosum. The wilt-susceptible alfalfa seedlings were derived from selfed seed of known susceptible clonal lines obtained from the variety Du Puits. Good infection resulted when bacterial from beef-lactose-agar cultures were spread on the cut surface of cotyledons clipped with scissors or when pinched with a serrated blunt-nosed forceps dipped in wilt inoculum. Wilt symptoms characterized by stunting, leaf curling, and internal discoloration of the tap root developed

in 50-85% of seedlings 3-5 weeks after inoculation. C. insidiosum was reisolated from roots of diseased seedlings as early as three weeks following inoculation. If this method proves successful, it should enable us to test large numbers of alfalfa seedlings for susceptibility to bacterial wilt in a much shorter period than was heretofore possible.

Several other problems under investigation include: Identification of viruses infecting legumes in the field. Studies are also being conducted on fungicides for reducing the incidence of Helminthosporium leaf spot in Kentucky bluegrass. The incidence and destructiveness of stripe smut caused by Ustilago striaformis is being investigated in Kentucky bluegrass with particular reference to the variety Merion. Studies have shown that the Merion variety is extremely susceptible to this smut. Some effort is also being expended in studying Sclerotinia trifoliorum, the clover crown rot organism, in relation to infection in some forage legumes.

Forage Plant and Animal Grazing Management Group

D. E. McCloud, Discussion Leader

Discussion Leader, McCloud, spoke briefly on the complexity of the plant-soil-animal interrelationship involved in pasture experiments and indicated that the discussion for the morning would center around five topics: 1) the role of pastures in high-producing dairy enterprises, 2) continuous vs. rotational grazing, 3) toxicity problems on pastures, 4) grazing experiments presently under way in the Southeast, and 5) grain vs. forage for high levels of livestock production.

McCullough, Georgia: Pastures are given less attention in the Southeast particularly in dairying. In view of the idea that we should consider maximum production per acre should not the stored feed regime be considered?

McCloud: Yes, however, so far in our grazing experiments we have been unable to get enough treatments into the experiments to study all systems which should be compared.

McCullough: Is not pasture likely to become the alternate system?

McCloud: Some people think so. Certainly the two should be integrated into a profitable dairy program at production levels presently achieved by most dairymem.

McCullough: High production on pasture is difficult to maintain continuously. Hence, it seems logical that high-quality forage must be stored. We would still use 75 to 80% of the forage in the feed program. The principal problem is maintaining high-quality forage.

Browning, Mississippi: Permanent pastures do not hold up in the summer. Winter and spring pastures are high in quality, but the summer decline still plagues most dairymen.

Ellzey, Louisiana: Through management we can keep rather good quality throughout the summer, particularly with supplemental pastures of summer annuals.

Blaser, Virginia: There is no way to maintain forage quality with high-producing dairy herd. We must integrate grazing management with the harvested forage program. The quality and growth stage of the crops should be considered. Usually high digestible crops are grazed. Often harvested crops are low in digestibility. Grain feeding could offset low quality forage.

Johns, Louisiana: What is the effect on the cow switching from pasture to stored feed? How does this affect milk production? and how do the cows react?

McCullough: The answer is not well known. Dairying remains as somewhat of an art. Some changes in feed occur even in stored feed all the time.

Johns: The decision to harvest or graze is difficult particularly with millet when it is of high quality.

McCloud: Some dairymen are now following a system similar to the one we recommended in Flordia for pearl millet which involves careful rotational grazing to maintain the millet between a maximum of about 30 inches and a minimum stubble height of 6 inches.

Johns: We do not seem to get as much grazing as clipping trials would lead one to expect.

McCullough: Possibly the answer lies in forage quality. We do get production from winter pastures where the quality is high commensurate with forage yields.

Riewe, Texas: Sometimes our gains are low due to lack of available forage.

Patterson, Alabama: How much forage do we actually harvest through the animals from pastures?

Alexander, Beltsville, Md.: Cows utilize 90% of the available pasture in our experiment at a high stocking level, 80% at the medium stocking level, and 60 to 65% at the low stocking rate.

Hoveland, Alabama: Warm-season pastures are generally less well utilized than cool-season pastures.

Patterson: In our experiments it took 9 pounds of dry matter from ladino-orchardgrass to produce a pound of beef with yearling steers and up to 25 pounds of dry matter per pound of beef from Coastal bermudagrass pastures.

Woodhouse, No. Carolina: We have had similar figures with wide extremes indicating either high or low efficiency depending upon species and intensity of management.

Riewe: Are we not too concerned with maximum utilization, we could reach a point of no gain.

Alexander: With continuous grazing could you go to high utilization without overgrazing?

Riewe: Depending upon climate this might be possible if you stock for the dry periods, you will have a surplus in the better moisture periods. With this system you would not overgraze.

Gilbert, No. Carolina: You cannot accumulate forage with cool-season crops.

McCloud, Maintenance of optimum leaf area may be a better criterion than accumulation of growth. Can you overgraze a continuously grazed pasture since with overgrazing the animals would harvest all of the available forage, at which point they must be removed from the pasture, and, in effect, you have a rotation grazing system.

Blaser: With continuous grazing you get high product per animal if available forage permits animal selectivity. With rotational grazing, on the other hand, you sacrifice some production per animal but should increase production per acre.

Johns: I agree with Blaser. If land is limited, close grazing maximizes carrying capacity.

McCullough: One should realize that 30 to 40% of the feed in a dairy farm goes into other uses besides feeding high-producing dairy cows. Heifers and dry cows must be maintained and here maximum productivity is not necessary.

Ruelke, Florida: What about the possible use of the Hohenheim system?

McCullough: Most dairymen actually follow a modification of this system perhaps less rigidly than it was originally conceived.

Blaser: Many livestock producers in Scotland, England, and Holland actually use this system. To effectively utilize the Hohenheim system, considerable extra fencing of pastures is necessary.

Hoveland: In Denmark, there was considerable use of the tethering system.

Killinger, Florida: With high utilization of highly fertilized millet, has anyone had any toxicity in grazing animals?

McCullough: We have had some death losses diagnosed as nitrate poisoning, but it may occur only sporadically under special conditions.

Killinger: We have not been able to produce toxicity.

Hoveland: Is it possible that there is an animal predisposing factor which causes toxicity symptoms?

McCullough: Yes, particularly of poor feed regimes.

Hein, Beltsville, Md.: With crested wheatgrass in the Far West they have some toxic problem.

Warwick, Beltsville, Md.: Is this nitrate poisoning or grass tetany?

Woodhouse: Grass tetany is generally associated with climatic factors.

Ruelke: I thought the group might be interested in a short film on grass staggers, a problem that does exist in Florida, and which can be alleviated with cobalt treatment. So far the problem seems to be associated with ronpha grass.

McCloud presented a survey of grazing experiments in the Southeast which covered 74 grazing experiments (57 beef, 14 dairy, and 3 sheep) for an average of about 6 per State, though the range was 2 to 10 per State. These grazing experiments under way involve some 2,400 acres, over 3,000 experimental animals, and a cash investment, exclusive of salaries and land, of over 2 million dollars. Of the entire group studied, 30 experiments reported no replications, 23 had only 2 replications, 11 had 3 replications, and 10 had 4 replications. The objectives of the experiments studied involved largely comparison of species and varieties, sequences of grazing. level of utilization, and rate of stocking. The question left with the group was what are the problems, the methods, and the future of grazing research. How could we best utilize this tremendous utilization of research facilities?

Blaser: Should not the objectives be the combination of high forage output with high animal output.

Morcock, Georgia: What type of experiments are being conducted in Europe where land is scarce?

Hoveland: In Europe, England particularly, the agriculture is government supported to a large extent so that more intensive systems of pasture management may be profitable.

Ruelke: In Europe, labor is plentiful and practices differ. Frequently new mechanical methods are combined with old systems such as hand gathering.

Woodhouse: With Europe's scarcity of land the pressure is on yield per acre. Labor is not an important limiting factor. There is a tremendous effort to produce high-quality forage for dairy cows. They do have climatic advantages and they are working against a high cost for grain.

McCullough: We have a great store of knowledge, but we have difficulty getting improved practices across to the farmer.

McCloud: Do you think the beef cattle industry will move toward greater use of grain?

Killinger: Dependent upon the type of beef cattle enterprise, brood cows, for instance, are best maintained on cheaper forages.

Ellington, Maryland: Figures from Virginia indicate greater cost from pasturing than from feeding for brood cows.

McCloud: In summary we certainly need to look at the direction of our present research. We have, in the Southeast, a tremendous investment in pasture experiments and as animal husbandmen and agronomists it is our challenge to make most effective use of these resources.

11:00 a.m. Closing Business Session - M. E. McCullough, Presiding

Chairman McCullough called for committee reports, the first was the committee to study the type of conference meetings desired by the membership in the future. Committee composed of Anthony, Chairman (Brenes, Offutt, Killinger, Craigmiles, Owen, Woolfolk, Bennett, Cope, Huffine, Gibson, Fribourg, Holt, Shoulders, and McCloud). Chairman Anthony indicated that the questionnaire on the future meetings of the Southern Pasture and Forage Crop Improvement Conference circulated to the membership showed an overwhelming majority for meetings each year at an experiment station as has been the procedure in the past. On the type of program desired, the results again indicated a considerable majority in favor of the combination type meeting composed of symposium sessions and panel discussions. Conference voted to accept the report of the meetings committee.

Resolutions committee composed of J. R. Harlan, Chairman, S. H. Dobson, and E. C. Holt. Be it resolved that we the members of the 18th Southern Pasture and Forage Crop Improvement Conference in official session assembled do hereby express our sincere and heartfelt thanks for the fine hospitality and the interesting and instructive tours arranged for us by the staff of the Agricultural Research Service, Beltsville, for our meeting June 13-16, 1961. We specifically with to express our appreciation to Dr. D. E. McCloud and Dr. C. W. Alexander for the excellent tour arrangements, to the personnel of the various animal and plant research branches, to the several commercial concerns sponosoring the tours and banquet and to the many others who helped to make our meeting so pleasant and successful.

Dr. O. C. Ruelke was elected by unanimous acclaim as the new member of the executive committee. Following the usual pattern of accession the newly elected member is elevated to Conference chairman in 1964.

Chm. McCullough expressed his thanks to the members present for their attendance at the meetings, to the executive committee, to the Agricultural Research Center and Plant Industry Station for the excellent facilities and fine tours, and to Dr. D. E. McCloud for his efforts in local arrangements.

The 1962 Conference chairman, M. S. Offutt, was introduced. His executive staff includes N. L. Taylor (1962), M. E. McCullough (1963), N. L. Taylor (1962), R. M. Patterson (1965), O. C. Ruelke (1966), and D. E. McCloud (Permanent Sec.).

REGISTRATION LIST - 1961

Name	Address	Affiliation
Alabama		
Anthony, W. B.	Auburn	Alabama Agr. Expt. Station
Donnelly, E. D.	"	" " "
Ensminger, L. E.	"	" " "
Harris, R. R.	"	" " "
Hoveland, C. S.	"	" " "
Patterson, R. M.	"	" " "
Rollins, G. H.	"	" " "
Arkansas		
Offutt, M. S.	Fayetteville	Arkansas Agr. Expt. Station
Florida		
Allen, R. J., Jr.	Belle Glade	Everglades Agr. Expt. Station
Haines, C. E.	"	" " "
Horner, E. S.	Gainesville	Florida Agr. Expt. Station
Hutton, C. E.	Jay	West Florida Agr. Expt. Station
Killinger, G. B.	Gainesville	Florida Agr. Expt. Station
Prine, G. M.	"	" " "
Ruelke, O. C.	"	" " "
Georgia		
Beardsley, D. W.	Tifton	Ga. Coastal Plain Expt. Station
Beaty, E. R.	Athens	Ga. Agr. Expt. Station
Craigmiles, J. P.	Griffin	" " "
Elrod, J. M.	Experiment	" " "
Forbes, I.	Tifton	Ga. Coastal Plain Expt. Station
Marchant, W. H.	"	" " "
McCullough, M. E.	Experiment	Ga. Agr. Expt. Station
Morcock, J. C.	Atlanta	Allied Chemical Corporation
Newton, J. P.	Experiment	Ga. Agr. Expt. Station
Powell, J. D.	Americus	Branch Expt. Station
Wells, H. D.	Tifton	Ga. Coastal Plain Expt. Station
Wofford, I. M.	Savannah	Southern Nitrogen Co., Inc.
Young, W. C.	Athens	Soil Conservation Service

Name	Address	Affiliation
Kentucky		
Buckner, R. C.	Lexington	Kentucky Agr. Expt. Station
Kendall, W. A.	"	" " "
Stroube, W. H.	"	" " "
Taylor, N. L.	"	" " "
Taylor, T. H.	"	" " "
Thompson, W. C.	"	" " "
Louisiana		
Ellzey, H. D.	Franklinton	Dairy & Pasture Expt. Station
Johns, D. M.	Homer	N. La. Hill Farm Expt. Station
Owen, C. R.	Baton Rouge	La. Agr. Expt. Station
Roark, C. B.	"	West La. Agr. Expt. Station
Maryland		
Alexander, C. W.	Beltsville	U. S. Department of Agriculture
Decker, A. M.	College Park	Md. Agr. Expt. Station
Ellington, C. P.	"	" " "
Erdman, L. W.	Beltsville	U. S. Department of Agriculture
Graumann, H. O.	"	" " "
Hanson, A. A.	"	" " "
Hanson, C. H.	"	" " "
Hein, M. A.	"	" " "
Henson, P. R.	"	" " "
Hollowell, E. A.	"	" " "
Howell, R. K.	College Park	Md. Agr. Expt. Station
Juska, F. V.	Beltsville	U. S. Department of Agriculture
Kreitlow, K. W.	"	" " "
Leffel, R. C.	College Park	Md. Agr. Expt. Station
McCloud, D. E.	Beltsville	U. S. Department of Agriculture
Miller, J. R.	College Park	Md. Agr. Expt. Station
Schillinger, J. A.	"	" " "
Sheets, T. J.	Beltsville	U. S. Department of Agriculture
Terrill, C. E.	"	" " "
Warwick, E. J.	"	" " "

Name	Address	Affiliation
Mississippi		
Bennett, H. W.	State College	Mississippi Agr. Expt. Station
Browning, C. B.	"	" " "
Johnson, H. W.	Stoneville	Delta Branch Expt. Station
Knight, W. E.	State College	Mississippi Agr. Expt. Station
North Carolina		
Dobson, S. H.	Raleigh	No. Carolina Agr. Expt. Station
Dudley, J. W.	"	" " "
Gilbert, W. B.	"	" " "
Lucas, H. L., Jr.	"	No. Carolina State College
Smart, W. G., Jr.	"	No. Carolina Agr. Expt. Station
Woodhouse, W. W., Jr.	"	" " "
Oklahoma		
Bates, R. P.	Ardmore	Noble Foundation
Chessmore, R. A.	"	" " "
Elder, C. W.	Stillwater	Oklahoma Agr. Expt. Station
Harlan, J. R.	"	" " "
Huffine, W. W.	"	" " "
Nelson, A. B.	"	" " "
Puerto Rico		
Fortuno, J. V.	Rio Piedras	Puerto Rico Agr. Expt. Station
South Carolina		
Beinhart, E. G.	Clemson	So. Carolina Agr. Expt. Station
Conley, C.	"	" " "
Eskew, E. B.	"	" " "
Gibson, P. B.	"	" " "
Maurer, T. C.	Spartanburg	Soil Conservation Service
McCarter, S. M.	Clemson	So. Carolina Agr. Expt. Station
McClain, E. F.	"	" " "
McNatt, F. L.	"	Nitrogen Division Allied Chemicals
Miller, C. R.	"	So. Carolina Agr. Expt. Station
Watkins, P. W.	"	" " "

Name	Address	Affiliation
Tennessee		
Burns, J. D.	Knoxville	Tennessee Agr. Expt. Service
Fribourg, H. A.	"	" " "
Turner, J. R.	"	United States Borax
Texas		
Bashaw, E. C.	College Station	Texas Agr. Expt. Station
Holt, E. C.	"	" " "
Parks, P. F.	"	" " "
Riewe, M. E.	Angleton	" " "
Staten, R. D.	College Station	" " "
Weihing, R. M.	Beaumont	" " "
Virginia		
Blaser, R. E.	Blacksburg	Virginia Agr. Expt. Station
Brown , R. H.	"	" " "
Carter, R. C.	"	" " "
Drake, C. R.	"	" " "
Hallock, D. L.	Holland	" " "
Hammes, R. C.	Middleburg	" " "
Mays, D. A.	Blacksburg	" " "
Miller, J. D.	"	" " "
Shoulders, J. F.	"	" " "
Smith, T. J.	"	" " "
Sweere, P. C.	"	" " "
Taylor, L. H.	"	" " "
Williams, A. S.	"	" " "
District of Columbia		
Griffith, W. K.	Washington	American Potash Institute
Lawrence, C. C.	"	British Embassy
Paulling, J. R.	"	U. S. Department of Agriculture
Richards, C. R.	"	" " "
Wagner, R. E.	"	American Potash Institute